Reg. No. : ....

Name : ....

K19U 0580

IV Semester B.Sc. Degree (CBCSS – Reg./Supp./Imp.) Examination, April 2019
(2014 Admission Onwards)
COMPLEMENTARY COURSE IN MATHEMATICS
4C04 MAT – PH : Mathematics for Physics and Electronics – IV

Time : 3 Hours Max. Marks : 40

SECTION – A

All the first **4** questions are **compulsory**. They carry **1** mark **each**.

1. Find curl, $\bar{r}$, $\bar{r} = x\bar{i} + y\bar{j} + z\bar{k}$
2. State Green's theorem.
3. Give the iteration formula for Euler method.
4. What is an algebraic equation ?

SECTION – B

Answer **any 7** questions from among the questions **5** to **13**. These questions carry **2** marks **each**

5. Find the arc length of that portion of the circular helix x = cost, y = sint, z = t from t = 0 to t = π.
6. Find the curvature of a circle of radius a.
7. Find the directional derivative of f(x, y) = xy at (1, 2) in the direction of $\bar{a} = \frac{\sqrt{3}}{2}\bar{i} + \frac{1}{2}\bar{j}$

8. Evaluate $\int_C F.dr$ where $F = -y\vec{i} - xy\vec{j}$ and c is the circular arc given by

$r(t) = \cos t\,\vec{i} + \sin t\,\vec{j}$, $0 \le t \le \frac{\pi}{2}$.

9. $F(x, y) = y\vec{i} + x\vec{j}$, evaluate $\int_{(0,0)}^{(1,1)} F.\,dr$.

10. Find the area of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ using Green's theorem.

11. Show that $\nabla = \Delta E^{-1}$.

12. Explain Euler method to solve first order ordinary differential equation.

13. Using Taylor series, solve $y' = x - y^2$, $y(0) = 1$.

SECTION – C

Answer **any four** questions from among the questions **14** to **19**. These questions carry **3** marks **each** :

14. If $F = f(x, y, z)$ is a differentiable vector field, show that div (curl F) = 0.

15. Find the workdone by the force field $F(x, y) = (e^x - y^3)\,\vec{i} + (\cos y + x^3)\,\vec{j}$ on a particle that travels once around the unit circle $x^2 + y^2 = 1$ in the counter clockwise direction.

16. Find real root of the equation $x^3 - 2x - 5 = 0$ using Bisection method.

17. Use Picard's method to obtain y for x = 0.25, $\frac{dy}{dx}=\frac{x^2}{y^2+1}$, $y(0) = 0$.

18. Derive Newton's forward interpolation formula.

19. Find $\frac{dy}{dx}$ for the function at x = 3.

x :	3	3.2	3.4	3.6	3.8	4
y :	–14	–10.032	–5.296	0.256	6.672	14

SECTION – D

Answer **any 2** questions from among the questions **20** to **23**. These questions carry **5** marks **each**.

20. Find the curvature of the ellipse $\vec{r} = 2\cos t\,\vec{i} + 3\sin t\,\vec{j}$ at the end points of its major axis.

21. Verify Gauss divergence theorem for $f(x, y, z) = 2x\vec{i} + 3y\vec{j} + z^2\vec{k}$ across the unit cube.

22. Evaluate $\int_1^3 \frac{1}{x}\,dx$ by simpsons rule with 8 strips.

23. Use Runge-Kutta method to solve $10\frac{dy}{dx} = x^2 + y^2$, $y(0) = 1$ for the interval $0 < x \le 0.4$ with $h = 0.1$.
